

UTILITY PATENT APPLICATION TRANSMITTAL (Small Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.

EM 1999:01

Total Pages in this Submission

34

TO THE ASSISTANT COMMISSIONER FOR PATENTS

Box Patent Application

Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

CURSOR CONTROL DEVICE FOR CONVENIENT AND ERGONOMIC
HAND-HELD OR WORK SURFACE USE

and invented by:

DAVID M. LIENFELD

If a CONTINUATION APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Which is a:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Which is a:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having 22 pages and including the following:
 - a. ☒ Descriptive Title of the Invention
 - b. ☒ Cross References to Related Applications (if applicable)
 - c. ☒ Statement Regarding Federally-sponsored Research/Development (if applicable)
 - d. ☒ Reference to Microfiche Appendix (if applicable)
 - e. ☒ Background of the Invention
 - f. ☒ Brief Summary of the Invention
 - g. ☒ Brief Description of the Drawings (if drawings filed)
 - h. ☒ Detailed Description
 - i. ☒ Claim(s) as Classified Below
 - j. ☒ Abstract of the Disclosure

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Application Elements (Continued)

3. ☒ Drawing(s) (when necessary as prescribed by 35 USC 113)
a. ☒ Formal b. ☐ Informal Number of Sheets 2
4. ☒ Oath or Declaration
a. ☒ Newly executed (original or copy) ☐ Unexecuted
b. ☐ Copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional application only)
c. ☐ With Power of Attorney ☐ Without Power of Attorney
d. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation By Reference (usable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Computer Program in Microfiche
7. ☐ Genetic Sequence Submission (if applicable, all must be included)
a. ☐ Paper Copy
b. ☐ Computer Readable Copy
c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

8. ☐ Assignment Papers (cover sheet & documents)
9. ☐ 37 CFR 3.73(b) Statement (when there is an assignee)
10. ☐ English Translation Document (if applicable)
11. ☒ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☐ Certificate of Mailing
☐ First Class ☒ Express Mail (Specify Label No.): EJ942874636US

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Accompanying Application Parts (Continued)

15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)

16. ☒ Small Entity Statement(s) - Specify Number of Statements Submitted: 1

17. ☐ Additional Enclosures (please identify below):

~~Continuation of application by "Express Mail"~~ **DMF**

Fee Calculation and Transmittal

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims		- 20 =	0	x \$9.00	\$0.00
Indep. Claims		- 3 =	0	x \$39.00	\$0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$380.00
OTHER FEE (specify purpose)					\$0.00
TOTAL FILING FEE					\$380.00

☒ A check in the amount of **\$380.00** to cover the filing fee is enclosed.

☐ The Commissioner is hereby authorized to charge and credit Deposit Account No. _____ as described below. A duplicate copy of this sheet is enclosed.

☐ Charge the amount of _____ as filing fee.

☐ Credit any overpayment.

☐ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.

☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated:

[Signature]
Signature

CC:

FEE TRANSMITTAL

for FY 1999

Patent fees are subject to annual revision.
Small Entity payments must be supported by a small entity statement,
otherwise large entity fees must be paid. See Forms PTO/SB/09-12.
See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT (\$)

Complete if Known

Application Number _____
Filing Date _____
First Named Inventor **DAVID M. LILENFELD**
Examiner Name _____
Group / Art Unit _____
Attorney Docket No. **FM1999:01**

METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number _____

Deposit Account Name _____

☐ Charge Any Additional Fee Required
Under 37 CFR §§ 1.16 and 1.17

2. ☒ Payment Enclosed:

☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 760	201 380	Utility filing fee	380
106 310	206 155	Design filing fee	
107 480	207 240	Plant filing fee	
108 760	208 380	Reissue filing fee	
114 150	214 75	Provisional filing fee	

SUBTOTAL (1) (\$ **380.00**)

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	X	
Multiple Dependent	-3** =	X	

**or number previously paid, if greater; For Reissues, see below

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
103 18	203 9	Claims in excess of 20
102 78	202 39	Independent claims in excess of 3
104 260	204 130	Multiple dependent claim, if not paid
109 78	209 39	** Reissue independent claims over original patent
110 18	210 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ **0**)

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 380	216 190	Extension for reply within second month	
117 870	217 435	Extension for reply within third month	
118 1,360	218 680	Extension for reply within fourth month	
128 1,850	228 925	Extension for reply within fifth month	
119 300	219 150	Notice of Appeal	
120 300	220 150	Filing a brief in support of an appeal	
121 260	221 130	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,210	241 605	Petition to revive - unintentional	
142 1,210	242 605	Utility issue fee (or reissue)	
143 430	243 215	Design issue fee	
144 580	244 290	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
126 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	
146 760	246 380	Filing a submission after final rejection (37 CFR § 1.129(a))	
149 760	249 380	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$ **0**)

SUBMITTED BY

Name (Print/Type) **DAVID M. LILENFELD**
Signature **[Signature]**

Registration No. **PRO SE**
(Attorney/Agent)

Complete (if applicable)

Telephone **(770) 438-2877**
Date **AUGUST 23, 1999**

**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR**

Docket Number (Optional)

FM1999:01

Applicant, Patentee, or Identifier: DAVID M. LILENFELD

Application or Patent No.: _____

Filed or Issued: _____

Title: CURSOR CONTROL DEVICE FOR CONVENIENT AND
ERGONOMICH HAND-HELD OR WORK SURFACE USE.

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- ☒ the specification filed herewith with title as listed above.
☐ the application identified above.
☐ the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ No such person, concern, or organization exists.
☐ Each such person, concern, or organization is listed below.

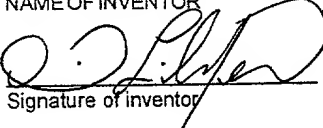
Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

DAVID M. LILENFELD
NAME OF INVENTOR

NAME OF INVENTOR

NAME OF INVENTOR


Signature of inventor

Signature of inventor

Signature of inventor

August 23, 1999
Date

Date

Date

TITLE OF THE INVENTION

Cursor control device for convenient and ergonomic hand-held or work surface use.

Inventor:

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CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable.

5 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable.

REFERENCE TO MICROFICHE APPENDIX

10

Not Applicable.

BACKGROUND OF THE INVENTION

Generally speaking, there are two kinds of data input tools used with computers, a keyboard and a cursor control device. The present invention relates to a cursor control device which can be conveniently and ergonomically operated while being held in the user's hand or while resting on a work surface.

Cursor control devices are generally of two types, the mouse and the trackball. A mouse includes a ball that depends from the underside of the mouse body and rests upon a flat work surface. A trackball, which is somewhat analogous to an upside down mouse, includes a ball protruding through the top of the trackball body which is manipulated by the user's fingers, hand or thumb. With both the mouse and trackball, rotation of the ball causes the transmission of data to the computer which causes a corresponding movement of the cursor on the computer screen. Cursor control devices also consist of keys used in conjunction with the ball to transmit additional data to the computer. Uses of cursor control devices in connection with computers

include activation of menus, selection of menu choices, movement and advancement of windows, blocking and moving text and data, drawing and reshaping lines and objects and the "pointing" and "clicking" technique used to advance graphical programs, such as the Internet.

Originally, because computer programs were primarily operated by the user entering text, the most used computer data input tool was the keyboard. The cursor control device was mainly used to control the location the text was entered. While today the keyboard remains an integral instrument in operating computers, the growing popularity of certain operating systems, such as MICORSOFT WINDOWS and MAC OS, and certain computer programs, such as design tools, computer games, voice-driven software and graphical interfaces, such as the Internet, has placed an increasingly heavy demand for the functions performed by cursor control devices. While the primary function of the keyboard is to enter text into the computer, almost all computer programs now provide a graphical environment which necessitates almost constant movement of the cursor. Consequently, the importance of the cursor controller has greatly increased to become equivalent to that of the keyboard. In fact, research directed by Peter W. Johnson of University of California Berkeley/San Francisco Ergonomics Lab, indicates that for the average user the cursor control device consumes one-third to two-thirds of the working time on a computer.

However, as originally conceived cursor control devices were not designed for the protracted and extensive use which is now required of them. Instead these devices were intended to have a secondary role complimentary to the primary data input tool, the keyboard. Because of their mere secondary role, cursor control devices were meant to rest on the work surface and to the side of the keyboard in a stationary position. This position allowed the user's hand to be quickly and conveniently moved from the keyboard to the cursor controller and then back to the keyboard which occupied most of the user's time. The efficacy of this design of the cursor

control device as merely secondary to the keyboard has been made obsolete by the new and extensive importance of the cursor control device.

The increased importance that cursor control devices play in the operation of computers has revealed several design deficiencies, mainly being inferior ergonomics. Because the mouse and the trackball lay on a flat work surface next to the keyboard, to operate these devices the user must bend his or her arm at the elbow, forwardly extend his or her forearm, wrist, and hand and keep this unsupported position the entire time the device is being used. Maintaining this position is uncomfortable and tires the muscles of the shoulder, elbow, forearm, wrist and hand.

Prior art cursor control devices suffer other ergonomic deficiencies. Cursor control devices which lay on a flat surface force the user's hand into an unnatural position with his or her palm facing downward. This position is significantly inferior to the ergonomically preferred neutral (or sideways) position. Furthermore, actuating mouse and trackball buttons as existing in the prior art causes the hand fatigue since the buttons typically require the unnatural movement of the user's fingers in a downward, instead of inward, direction. This is particularly troublesome when a key on the cursor controller must be continuously actuated for an extended period of time.

As the cursor control device occupies even greater amounts of the computer user's time these ergonomic deficiencies become more pronounced and troublesome. The prolonged and repetitive use of the mouse and trackball cause the user discomfort, fatigue, and pain. After a protracted period of use, such as many hours, it is not unusual for the muscles of the arm, hand, and wrist to become fatigued, making it uncomfortable and even painful to continue to use these devices. Significantly, various repetitive stress injuries, such as the widespread carpal tunnel syndrome, are now associated with extensive use of these stationary devices.

Further disadvantages of these cursor control devices are that they necessitate an available work surface upon which to rest. In many instances, there may be no space available or it may be too limited for convenient use. The problem is particularly acute with mice which must be moved along the work surface to coordinate movement of the cursor on the computer screen. Thus, as larger computer screens become more common, additional space on the work surface is needed to maintain full control of the cursor. The cursor control device's necessity for a work surface upon which to lay is also problematic because the height of the available work surface may be uncomfortable for the individual user.

In addition to the problems associated with these devices resting on the work surface, one of the primary drawbacks of mice and trackballs in the art is that they do not allow for hand-held use. Originally, because the user spent most of his or her working time on the computer using the keyboard there was no need for the cursor control device to be suitable for hand-held use. However, as the significance of the cursor control device in operating computers has increased and users' hands spend less time on the keyboard, the need for the cursor control device to be suitable for hand-held use has now arisen.

While mice known in the art may be suitable for use on a flat work surface, an effort to use a mouse in a hand-held manner fails for several reasons. First, to reach the ball, which protrudes from the underside of the mouse body, requires the user to uncomfortably stretch the thumb or fingers around the bottom of the mouse. In addition to causing discomfort this is not the optimum hand position from which to manipulate the ball. Also, if the mouse is being hand-held the ball cannot be manipulated because once pressure is applied to it, or once the mouse is turned at an inverted angle, the ball recedes into the body of the device beyond the user's reach. Furthermore, the keys found with mice are not aligned so as to orient the fingers for

simultaneous actuation of the keys and the ball if the mouse is being-held. Furthermore, the shape of the mouse is not designed to fill the user's hand and thus, to keep the mouse from slipping out of the hand, the user would have to maintain a clenched or contracted hand position the entire time the mouse is being used. This would cause fatigue, pain and discomfort after a protracted period of use. In short, mice known in the art are not designed such that they can be hand-held and operated at the same time. Thus, mice, as known in the art, are not suited for hand-held use.

While it may be physically possible to hand-hold trackballs known in the art, like mice, they are also not suitable for hand-held use. Trackballs are designed to lay on the work surface with the user's hand on top of the device. The bodies of trackballs are typically too large to be held in the average user's hand. In addition to the size of the body, the balls found in trackballs are also typically too large to allow the device to be held in the average user's hand and, even if the trackball can be held, the ball is too large to be manipulated with one hand. This is true because neither the ball nor the buttons are aligned such that they can be actuated while the user holds the device. Furthermore, keys of the trackball cannot be activated because the fingers are occupied with holding the device and the keys on trackballs are not positioned so as to permit operating by fingers which are also being used to hand-hold the trackball. For example, LOGITECH, INC. of Fremont, California, sells the TRACKMAN MARBLE+ which is designed to lay on the work surface with its top surface accommodating the user's entire hand. The length and width of the top of the TRACKMAN MARBLE+ is the size of the average person's outstretched hand and therefore it is too long and too wide to be hand-held. Furthermore, even if the device could be held in the hand, the ball is so large that it could not be manipulated while

still holding the device nor would the fingers, which would be occupied with holding the device, be free to actuate the balls or keys.

In addition to individual mouse and trackball devices, combined mouse-trackball and touchpads are other cursor control devices known in the art. However all the deficiencies of mice and trackballs which have been discussed above also apply to these devices. Combined mouse-trackballs and touchpads are also only suitable for use while laying on flat work surfaces, in close proximity to the keyboard. Thus users of these devices must also maintain a rigid, unsupported arm, wrist and hand position the entire time the device is being used. Furthermore, these devices require some available work surface and also fail to allow the user to achieve a neutral hand position. Touchpads are also not suitable for hand-held use because while the hand is being used to hold the touchpad, no fingers are available to make contact with or operate the touchpad. Thus, the cursor control devices known in the art are designed for use on a flat work surface but are not suitable for hand-held use.

As discussed above, extensive use of a cursor control device while it is resting on a work surface has significant ergonomic disadvantages and is known to cause repetitive stress injuries, such as carpal tunnel syndrome. Thus, when a user is primarily working with the cursor control device (and not the keyboard), for example, while on the Internet, the most convenient and comfortable position for the device is in the user's hand. This allows the user to hold his or her arm and hand in whatever position he or she chooses and still readily manipulate the ball and actuate the keys. However, because there remain uses of the computer which require the keyboard as the primary data input tool, such as for entering text, cursor control devices should concurrently be suitable for the "traditional" role as a secondary data input tool. Therefore, a cursor control device for today's computer should be suited for two types of uses: one being

intermittent use on the work surface (as complimentary to the keyboard); the second being hand-held use (when the cursor control device is being used as the primary input tool).

Some input devices known in the art are designed for hand-held use (though, as will be shown, not ideal for hand-held use). However, they are not suited for use while laying on a flat work surface and thus are not appropriate for intermittent use when the keyboard is being used as the primary data input tool. U.S. Patent 5,668,574 to Jarlance-Huang, for example, discloses such a device. An attempt to use U.S. Patent 5,668,574 to Jarlance-Huang while it is laying on a flat work surface would fail because the user's fingers which must wrap around and under the device to actuate the buttons and therefore would prevent the device from laying flat on the work surface. Also, this device is not convenient for work surface use because the operating buttons are underneath the device. Thus, if the user is working primarily with the keyboard, he or she would be required to move his or hand from the keyboard, to a position underneath the cursor control device, essentially having to pick the cursor control device off the surface, manipulate the device to control the cursor, then place the device back on the work surface and move his or her hand back to the keyboard. This substantially slows the work process by requiring unnecessary arm and hand movements. Furthermore, if this device were used while it is laying on the work surface, the user's wrist would be in an unnatural, protracted position instead of the preferred neutral position. Therefore, while this device may be suitable for hand-held use it is not suitable for the secondary or complimentary role the cursor control device must take when the keyboard is being used as the primary data input tool; in other words it is not suitable for use while laying on a flat work surface.

U.S. Patent 5,666,138 to Culver also discloses a hand-held device which apparently can be used to control a computer cursor, but, like U.S. Patent 5,668,574 to Jarlance-Huang, it is not

suitable for work surface use because the user's fingers must wrap around and under the device to operate it. This would interfere with the device lying flat on the work surface. Thus, this device is likewise not suitable for the secondary or complimentary role the cursor control device must take when the keyboard is being used as the primary data input tool. Similarly, U.S. Patent 5,767,841 to Hartman requires hand-held operation and does not allow on-the-surface use of the trackball. With U.S. Patent 5,767,841 to Hartman, if the trackball is laid on the surface the enter and drag keys on the first side would be unintentionally activated while the user is operating the enter and drag keys on the second side.

U.S. Patent 5,760,766 to Auber and Mosley discloses another trackball which is apparently designed for hand-held use. However, this device is also unsuitable for comfortable and ergonomic use on the work surface because it is too small and the ball and the buttons are too close together. To operate this device while it is laying on a flat work surface would require the user to keep his or her hand in an unnaturally clenched or contracted position. Also, if used while laying on the work surface this device offers no place to rest the thumb or hand so the user must hold his or her hand out of the way without support. Also, even as a hand-held device, U.S. Patent 5,760,766 to Auber and Mosley suffers ergonomic deficiencies. To hold the device requires the user to clench or contract his hand beyond a position which is natural. If this is done for an extended period of time, as is now typical for cursor control devices, the user will experience discomfort and muscle fatigue. Therefore, none of the hand-held input devices known in the art allow convenient or comfortable work surface use. Furthermore, these devices are not even ideal for hand-held use.

Thus, it can be seen that cursor control devices currently known in the art are of two types. One type being suitable for use while laying stationary on a flat work surface next to the

keyboard. These devices, though, are not suitable for hand-held use. The second type consists of those devices designed for hand-held use. But, as discussed above, these are not suitable for use while laying on a flat work surface. As cursor control devices continue to be used in record numbers and for prolonged periods of time there is a need for a device which is suitable for use in a primary role (while being hand-held) and secondary to the keyboard (laying on a flat work surface).

BRIEF SUMMARY OF THE INVENTION

This invention relates generally to a computer data input tool and specifically to a device to control a computer cursor which can be conveniently and ergonomically operated while resting on a flat work surface or while being held in the user's hand. The computers with which the device of the present invention may be used are lap top, notebook, or a personal computer, and the like. The present invention overcomes or substantially reduces the noted deficiencies of the prior art by providing a cursor control device which can be easily and ergonomically operated while being held in the user's hand or while resting on a flat work surface thereby reducing fatigue in the user's upper extremity and reducing repetitive stress injuries associated with mouse and trackball use. Thus, it is a primary object of the present invention to provide a cursor control device use of which minimizes arm, hand and wrist fatigue even during prolonged periods of continuous use by allowing the user to achieve a completely neutral, freely moving position of the user's arm, while at the appropriate times (as determined by the user) the device can be used while resting on the work surface. The device can be used in these two modes without any mechanical changes or transformations. Because the device can be used while hand-held, the device is readily operable when there is no work surface available.

A further object of the present invention is to provide a means of operating the computer cursor in a variety of arm positions as decided by the needs and preferences of each individual user. For example, the device may be used while the user is sitting, during which time the user may place his or her hand with the device on his or her lap or by his or her side or while the user rests his or her hand on the work surface. In any of these positions, the user can maintain his or her hand in the preferred neutral position. The present invention also allows for actuation of the keys by the slight inward flexing of the user's fingertips as opposed to an unnatural downward motion as required by the devices of the art.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and are intended to provide further explanation of the invention claimed. These and other advantages of the invention, as well as the preferred embodiment, will be best understood by reference to the attached drawings.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a view of the top of the device which shows the device being used on a flat work surface, by the right hand.

Figure 2 is a view from the underside of the device which shows the device during hand-held use, by the right hand.

Figure 3 is a view of the top of the device which shows the device being used on a flat work surface, by the left hand.

Figure 4 is a view from the underside of the device which shows the device during hand-held use, by the left hand.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a cursor control device 10 for convenient and ergonomic work surface or hand-held use. It will be understood that the present invention relates only to the physical configuration of the device 10 and not its electrical or computer interface functions, both of which are well known in the art. Neither the electrical or computer functions are claimed as my invention but are only discussed below for the purpose of making a full disclosure. Furthermore, for purposes of brevity, the device 10 of the present invention described in this section is for use by the right hand, as shown in Figures 1 and 2. However, it is to be understood that this description shall also apply, in all respects equally, to the mirror image of the device 10 of the present invention for use by the left hand, as shown in Figures 3 and 4.

The device 10 of the present invention is generally comprised of a body 11 and a cable 18. The body 11 of the device 10 is preferably made of an injection molded plastic, as is known in the art. The body 11 is shaped so as to comfortably fit in the average user's hand, such that, referring to Figure 1, at the lower portion of the top of the body 11 there is a gentle swell 26 to fill the user's hand which will naturally be slightly cupped during the device's 10 use. The body 11 is further shaped such that the distance from the bottom edge 22 to the ball 16 is equal to the approximate length of the average person's thumb. The width of the body 11 is slightly less than the width of the average person's hand such that the device 10 can be held in the user's hand. The depth of the device 10 is such that it can be held comfortably by the user with only a slight contraction of the fingers and thumb.

Referring still to Figure 1, the device 10 of the present invention further consists of a ball 16 disposed upon the upper left portion of the body 11, part of which protrudes above the body 11 through a circular opening 20 with the remaining portion inside the body 11 and thus not

shown. In addition to the ball 16 protruding through the top of the body 11, the ball 16 is slightly exposed on the left side of the body 11 through the same circular opening 20. The ball 16 is preferably made of a smooth, hard plastic, as is known in the art. As noted above, the mirror image of this description is also claimed as my invention as an embodiment of the device 10 for use by the left hand, as shown in Figures 3 and 4. Preferably the ball 16 is as large as possible to give the user accurate control over the cursor during both work surface and hand-held use. However, the ball 16 size is limited so that it can be easily and comfortably manipulated by the user's thumb. The ball 16 is further limited so as to avoid adding too much weight to the device 10 or necessitating a larger body which would not comfortably fit in the user's hand. The shape of the body 11 and disposition of the ball 16 is such that during both work surface and hand-held use the user's thumb can be easily moved between a resting position on the body 11 and placement on the ball 16.

The body 11 further consists of an enter key 12 and a drag key 14 both disposed on the forward top of the body 11. More specifically, again referring to Figure 1, the enter key 12 is mounted on the top and frontal portion of the body 11 and the drag key 14 is mounted on the top and right front portion of the body 11, to the contiguous right of the enter key 12. The keys 12 and 14 extend from the forward portion of the top of the body 11 and angle downward along the body's 11 frontal curvature 24 to occupy the upper portion of the forward side of the body 11. The width of each key 12 and 14 is slightly greater than the width of the average person's finger such that when the user's finger rests on one of the keys 12 and 14 the entire width of the finger is accommodated. The keys 12 and 14 take the same contour as the body 11 and are at all points flush with the body 11. The keys are preferably made of the same injected molded plastic as the remainder of the body 11. The disposition of the keys 12 and 14 orient the hand in relation to the

body 11 such that the thumb is in the most optimum place to control the ball 16 and the ulnar fingers rest near or against the side of the body 11 which is opposite the ball 16.

The device 10 of the present invention further consists of a cable 18 fixed in a single position on the bottom side of the body 11 by a cable neck (not shown) as is known in the art.

5 The cable 18 provides power for the device 10 of the present invention and is intended to connect the device 10 with the computer system (not shown) for the transmission of data. Because the device 10 of the present invention is capable of being used while the user's arm moves freely about, cable 18 may be longer than cables typically found in the art.

10 The means of operating the device 10 of the present invention is in all respects the same whether being used on the work surface or while hand-held. Referring to Figure 1, when the device 10 of the present invention is being used on the work surface, the underside of the body 11 lays flat. The thumb is positioned on or near the ball 16 and can be rested in either of those positions or can be kept to the side of the body 11, to the left of the ball 16. The thumb is oriented so as to allow easy and comfortable manipulation of the ball 16. The forefinger is positioned on or above the enter key 12 and the middle finger is positioned on or above the drag key 14 permitting easy and comfortable actuation of the keys 12 and 14. The ulnar fingers rest next to or against the side of the body 11 which is opposite to the side containing the ball 16. The palm of the user's hand rests on the lower portion of the body 11 and is filled by the slight swell 26. As noted earlier, this description applies equally to the mirror image of the device as shown in Figure 3 for an embodiment intended for the left-hand.

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Referring now to Figure 2, when the device 10 of the present invention is being hand-held, the thumb rests on or near the ball 16 or can be kept to the side of the body 11, to the left of the ball 16. The thumb is oriented so as to allow easy and comfortable manipulation of the ball

16. The forefinger rests on or above the enter key 12 and the middle finger rests on or above the drag key 14 permitting easy and comfortable actuation of the keys 12 and 14. The disposition of the keys 12 and 14 align the hand such that the foremost portions of the ulnar fingers wrap around the side of the body 11 opposite the ball 16 and under the body 11 to support and hold the device 10 in the user's hand. According to the user's preference, the body 11 may alternatively or additionally be held by slight pressure from the tips of the user's first two fingers which are oriented to naturally occupy the frontal curvature of the body 11. The keys 12 and 14 offer sufficient resistance to prevent their inadvertent actuation when touched by the fingers but are sensitive enough to allow actuation when the fingers are slightly moved inward. The user may easily and conveniently activate the keys 12 and 14 as required through the natural inward flexing motion of the fingers or fingertips, without the unnatural downward motion typically demanded of existing prior art devices. The ability to use the device 10 of the present invention while hand-held, thus allowing a freely moving hand, or while the device is laying on the work surface, is the most significant advantage of the invention as it is ideal for reducing fatigue in the user's arm and reducing repetitive stress injuries associated with use of cursor controllers. As noted earlier, this description applies equally to the mirror image of the device as shown in Figure 4.

The device 10 of the present invention functions in the manner typical for known cursor control devices. Namely, the ball 16, the enter key 12, the drag key 14, and the cable 18 are to be connected to a circuit board (not shown) inside the body 11. The ball 16, which protrudes above the body 11, is manipulated by the user. As the ball 16 rotates it touches and turns two rollers (not shown) mounted at 90-degree angles to each other. One roller responds to back-and-forth movements of the ball 16 and transmits data through the circuit board to the computer to

move the cursor on the screen correspondingly to the movement of the ball. The other roller senses sideways movements, which correspond to side-to-side movements of the cursor on the screen. A spring loaded idler caster as known in the art (not shown) is provided to support and hold the ball 16 against the rollers. Additional spring loaded mechanisms (not shown) inside the
5 body 11 urge the ball 16 upward partially through the circular opening 20 and prevent gravity from forcing the ball 16 to recede into the body 11. The circuit board outputs a digital signal which is processed and generated into data and sent to the computer through the cable 18.

The keys 12 and 14 are actuated by the user to send additional data to the computer through a similar process as described above in relation to the ball 16. Actuation of the keys 12
10 and 14 sends a signal through conductors to the circuit board. The circuit board outputs a digital signal which is processed and generated into data and sent to the computer through the cable 18. The keys 12 and 14, which are disposed flush with the body 11, require only slight pressure to be actuated, however, the necessary pressure to activate the keys 12 and 14 is such that the user's fingers may rest on the keys 12 and 14 and used in addition to the rest of the hand to hold the
15 body 11 without the keys 12 and 14 being inadvertently activated.

While the above description of the device 10 of the present invention contains many specificities, these should not be construed as limitations on the scope of the invention, but rather as an exemplification of one preferred embodiment thereof. Alternatively to the above-described location of the cable connection to the body 11, the cable may be fixed at the front side of the
20 body 11, to the left of the enter key 12 and to the right of the ball 16. In the embodiment of the device 10 for the left hand, the cable would be connected to the front side of the body 11 to the right of the enter key 12 and to the left of the ball 16. This embodiment may provide a means by which the cable 18 is less obstructive with operation of the device 10.

As an alternative to use of a cable 18, the data may be sent from the device 10 of the present invention to the computer (not shown) by wireless techniques, such as infra-red or radio frequency transmissions. In a wireless embodiment, send/receive transducers (not shown) would be disposed at locations on the forward portion of the body 11 and would include a transparent shade (not shown) which provides an aperture for the passage of light energy therethrough. The transparent shade would hold a transmitter (not shown) on the inside with the transmitter being connected to the circuit board (not shown) inside the body 11. In this wireless embodiment the data generated by the rollers, optical encoders and circuit board is sent by electrical signals through a transducer window from the device 10 to a receptor on the computer (not shown). In response to this data, circuitry within the computer causes the cursor on the computer screen to move. In all other respects, use of the device 10 would be as already described. This process of wireless transmission of data is not claimed as my invention and is therefore not described in detail but is instead discussed for the purpose of making a full disclosure.

Another alternative embodiment occurs with the device 10 having slight grooves (not shown) on the side opposite the side with the ball 16 to provide the user with accommodations for his or her ulnar fingers. Whether the device is being hand-held or used on a work surface, the position of the grooves would work to align the user's thumb with the ball 16, forefinger with the enter key 12 and middle finger with the drag key 14. A mirror image of the embodiment described would be effective for the left-handed version of the device 10, as shown in Figures 3 and 4.

Another alternative embodiment has the body 11 further comprising a scroll wheel (not shown) as known in the art disposed between the enter key 12 and drag key 14. Scroll wheels permit the up and down scrolling of windows on the computer screen without requiring the

“pointing and clicking” technique typically required in a graphical environment. The scroll wheel consists of a spring-loaded supplementary control in the body 11 for generating additional transmissions to the computer which specifically control the scrolling rate and direction. Again, because the electrical and computer interface functions of the device 10 of the present invention are not claimed, they are described only briefly herein, merely for the purpose of making a full disclosure.

Another alternative embodiment has the ball 16 connected inside the body to optical encoders (as opposed to rollers) for transmission of data from the ball through the circuit board and to the computer. However, this electrical and computer processes are not claimed as a part of this invention and are therefore described not in detail or shown in the drawings but are merely discussed for the purpose of making a full disclosure. None of these alternative embodiments should be viewed as limiting the scope of the claimed portion of the device 10 of this invention.

The device 10 of the present invention provides a cursor control with an ergonomic design suitable for hand-held or work surface which minimizes arm, hand and wrist fatigue even during protracted period of continuous use. During work surface use, as shown in Figure 1, the device remains stationary. During hand-held use, as shown in Figure 2, the user can operate the device 10 of this invention with a freely moving arm and hand. In addition to the ergonomic advantages, this allows the device 10 to be used when there is no or insufficient area on the work surface on which to operate the device 10. The device 10 of the present invention also provides a means of controlling a computer cursor while the user is in a standing position, while user's hand is resting on the user's lap, while the user puts his arm in a relaxed position next to his side, and while allowing user to achieve a truly neutral hand position. The cursor control device 10 of

the present invention also allows for use in a variety of hand positions as decided by the needs and preference of each individual user.

It will now be understood that what has been disclosed herein comprises a novel cursor control device. Those having skill in the art to which the device 10 of the present invention pertains, will now, as a result of the applicant's teaching herein, perceive various modifications and additions which may be made to the invention. For example, the precise shapes described herein may be readily altered in varying ways while achieving the same objectives of the invention. For further example, the degree of the swell 26 may be increased or decreased without substantially reducing the principal advantages of the invention. Furthermore, the device 10 can be made in different sizes, can be custom designed for individual users and can be made in various colors. The device 10 can also be adjusted in shape so as to accommodate future advances in ergonomic sciences.

Accordingly, the scope of the device 10 of the present invention should be determined not by the embodiment illustrated, but by the appended claims and their legal equivalents. All such modifications and additions are deemed to be within the scope of the invention which is to be limited only by the claims appended hereto. It is to be understood that the drawings are designed for purposes of illustration only and are not intended as a definition of the limits and scope of the invention disclosed. It is the following claims, including all equivalents, which are intended to define the scope of this invention.

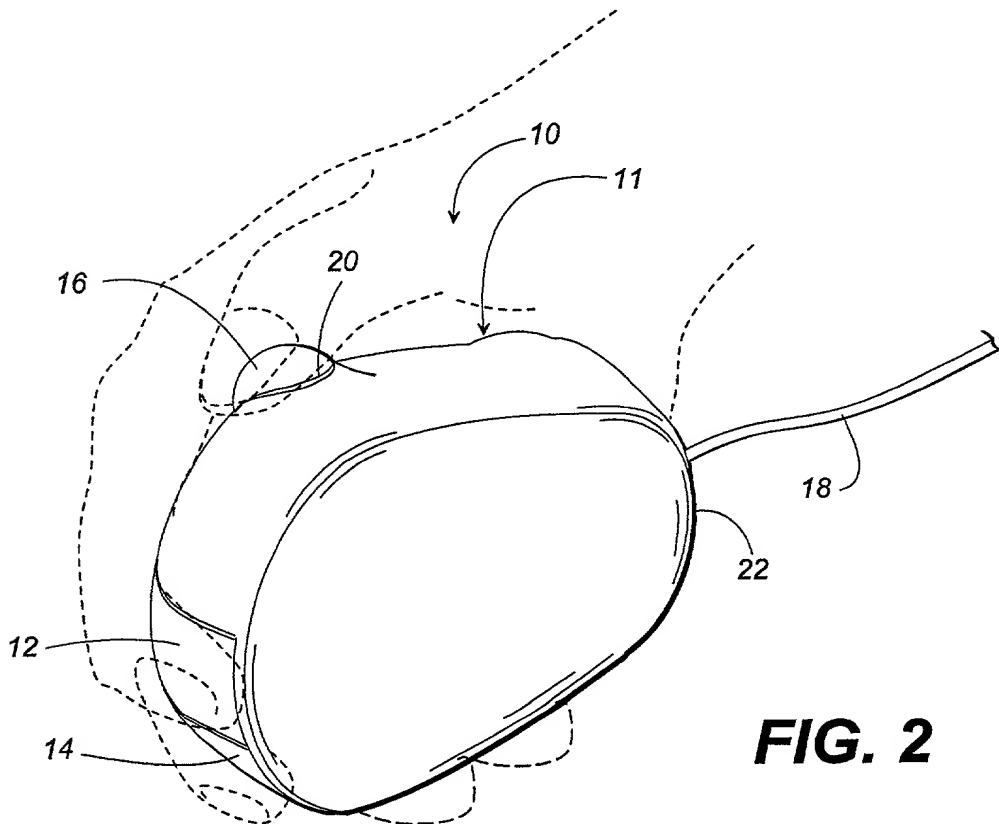
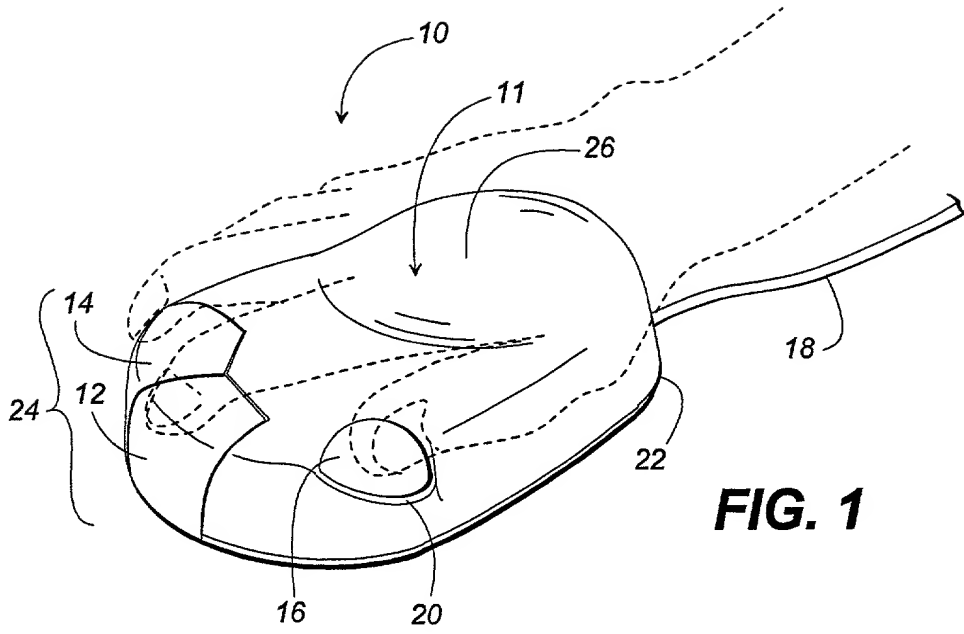
What I claim as my invention:

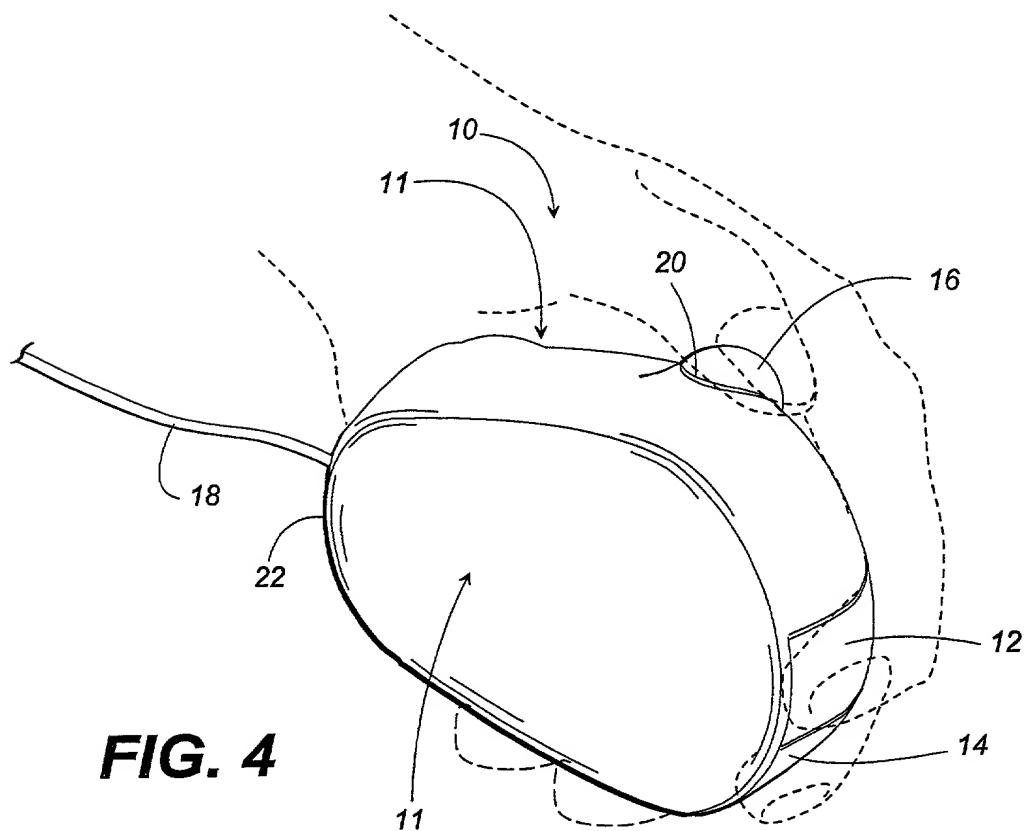
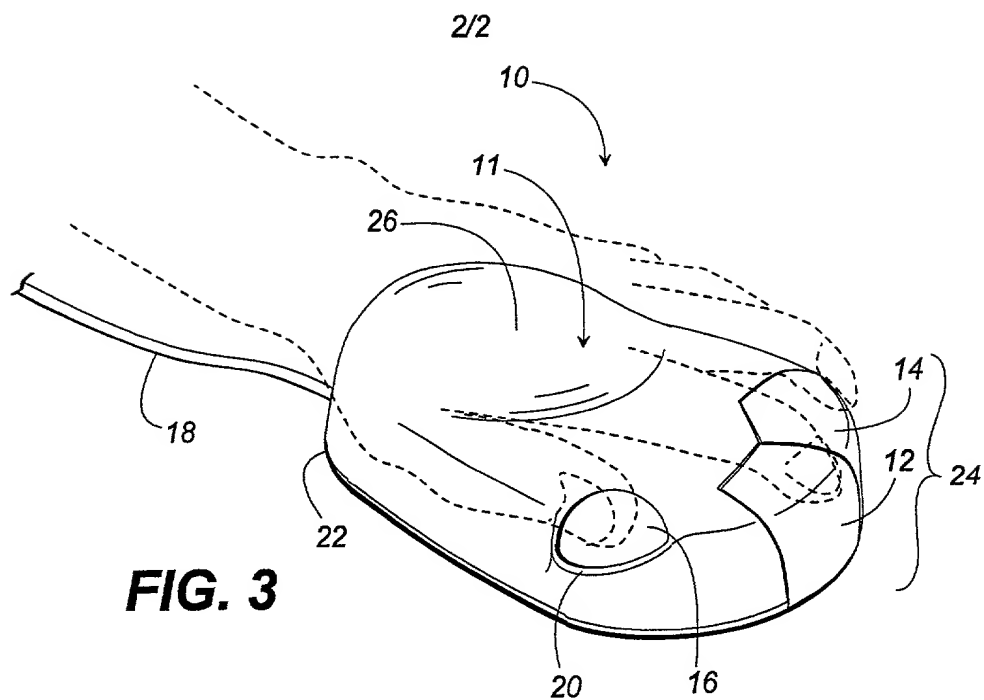
- 1 1. A cursor control device comprising:
 - 2 a. housing with a flat surface on the bottom and an ergonomic shape for
 - 3 fitting comfortably in the user's hand;
 - 4
 - 5 a roller ball rotatably mounted in the housing and protruding partially
 - 6 above the housing at about a front corner of said housing;
 - 7
 - 8 at least one key on top of said housing extending over the front side of
 - 9 said housing;
 - 10
 - 11 at least one electrical circuit inside said housing connected to said key and
 - 12 said roller ball; and
 - 13
 - 14 a communicator between said electrical circuit and a computer.
- 1 2. The device of claim 1 wherein said roller ball and said button are positioned such
- 2 that when the device is held in the user's hand, the user's thumb rests on the roller
- 3 ball and the user's middle finger rests on the button.
- 1 3. The device of claim 2 where the roller ball is at the tip of said user's thumb.
- 1 4. The device of claim 1 wherein said button is comprised of an enter key and a drag
- 2 key.

- 1 5. The device of claim 4 wherein said roller ball and said keys are positioned such
2 that when the device is held in the user's hand, the user's thumb rests on the roller
3 ball and the user's index and middle fingers rest on the keys.
- 1 6. The device of claim 1 further comprising grooves on the side nearest the user's
2 ulnar fingers where said grooves are shaped to accommodate said fingers.
- 1 7. The device of claim 1 wherein said communicator is an electric cable which
2 extends from device to computer system.
- 1 8. The device of claim 1 wherein said communicator further comprises a transparent
2 shade for transmitting radio frequency energy.
- 1 9. The device of claim 1 wherein said communicator further comprises a transparent
2 shade for transmitting infra-red energy.
- 1 10. The device of claim 1 further comprising a scroll wheel disposed between the
2 keys.
- 1 11. An ergonomic housing for an electronic input device comprising: a flat surface on
2 the bottom and a body shaped for fitting comfortably in the natural curvature of a
3 user's hand, such that the housing is suited for use of the device on a flat surface
4 or while in the user's hand.

ABSTRACT OF THE DISCLOSURE

The present invention is a cursor control device to be used in conjunction with a computer which allows for convenient, easy and ergonomic hand-held or work surface use. Actuation of the buttons on the device requires only the natural flexing or squeezing motion of the fingers and thumb.





Docket No.

FM: 1999:01

Declaration For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

CURSOR CONTROL DEVICE FOR CONVENIENT AND ERGONOMIC HAND-HELD
OR WORK SURFACE USE

the specification of which

(check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. or PCT International
Application Number _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, CFR Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

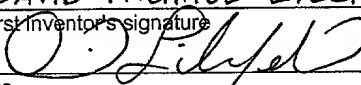
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(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Full name of fourth inventor, if any	
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